Condensed Matter Physics

MONTE CARLO INVESTIGATION INTO THE MAGNETIC PROPERTIES OF MECHANICALLY MILLED $GdAl_2$

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We have constructed a computational model of mechanically milled $GdAl_2$, a common magnetic system with disorder introduced into the lattice structure as a result of the mechanical milling. A standard metropolis monte carlo algorithm was used on the Laves phase cubic lattice of Gd ions. Initially, we have considered only the nearest-neighbor exchange and the uniaxial anisotropy in calculations of the system's energy. We examined the effects of the strength of the uniaxial anisotropy, as well as the effects of the quadruple defect disorder at varying levels of replacement. In each case, calculations were made of the energy, magnetization, and susceptibility of the system over a range of temperatures. We find that the effects of the uniaxial anisotropy on the susceptibility of the system are qualitatively similar to experimental data.